NOTE XXIII.

ZOOLOGICAL RESULTS OF THE DUTCH SCIENTIFIC EXPEDITION TO CENTRAL BORNEO.

THE CRUSTACEANS

BY

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Part I. MACROURA. [1])

(Plates 6, 7 and 8).

Palaemon (Eupalaemon) carcinus Fabr.

Confer: de Man, in: Max Weber, Decapoden des indischen Archipels, 1892, p. 421.

One nearly adult male collected by Dr. Nieuwenhuis at Oedjoe-tepoe.

Two young specimens from Pontianak.

The adult male is 225 mm. long, measured from the tip of the rostrum to the end of the telson. The rostrum is armed above with 14 teeth, of which the first three stand on the cephalothorax, the fourth immediately before the anterior margin; below it is armed with 13 teeth. The

1) Part II, Brachyura, will be published in Vol. XXI.

first pair of legs project with two fifth of the wrist beyond the end of the antennal scales. The second pair of legs are almost as long as the body, measuring 215 mm. and they project with the whole wrist beyond the antennal scales. The wrist (45 mm.) has exactly the same length as the palm, the fingers are slightly shorter and the mobile finger is covered with hairs.

In the specimens from Pontianak, measuring 150 resp. 130 mm. from the apex of the rostrum to the tip of the telson, the carpus of the second pair of legs is also still shorter than the whole hand, as could be expected, because the hand is shorter than the carpus only in those individuals the length of which is smaller than about 105 mm., as I have indicated in the paper quoted above.

The carapace is smooth. In both specimens the rostrum extends a little beyond the antennal scales and is armed with 14 teeth on the upper and with 13 on the lower margin; in both the first three teeth are placed on the cephalothorax. The second pair of legs have the following measurements:

Length of the body:	150 mm.	130 mm.
» » » merus:	18 »	16 »
» » » carpus:	$24^1/_2$ »	23 »
» » » palm:	18 »	$13^1/_2$ »
» » » fingers:	9 »	$10^1/_2$ »

The telson of the larger specimen agrees with Ortmann's description (in: Decapodenkrebse des Strassburger Museums, II, p. 697), presenting on each side two minute spinules that by far do not reach to the apex. In the other the apex of the telson is broken.

Palaemon (Eupalaemon) sintangensis, n. sp.

Fig. 1.

14 specimens, amongst which several males and two ova-bearing females, from Sintang.

As we know, the geographical distribution of some species of this genus, namely of those that inhabit also the sea, is rather large. It appears to me, however, probable that other species which occur exclusively in fresh water, are distributed over a small area, inhabiting e. g. one single large river with its tributaries. To the latter seems to belong *Pal. sintangensis*, the specimens of which have been collected by the Expedition in the interior of Borneo at Sintang.

Pal. sintangensis is apparently a species of small size, the largest specimen, a male, being only 57 mm. long from the apex of the rostrum to the tip of the telson. It bears a considerable resemblance to *Pal.* (*Eupal.*) *Ritsemae* de M. from Atjeh, exhibiting indeed almost the same characters, but it differs at first sight by the size of the eggs. An ova-bearing female and a younger one of *Pal. Ritsemae*, original type-specimens from the collection made by capt. Storm, are lying before me: the eggs are very numerous and small, being only 0,6 mm. long and 0,5 mm. broad.

The two females of *Pal. sintangensis*, however, carry a much smaller number of eggs and these eggs are more than twice as long and more than twice as broad as those of the Atjeh species: they are 1,6 mm. long and 1,2 mm. broad.

The ensiform rostrum has nearly the same form as that of *Pal. Ritsemae* and reaches to the end of the antennal scales, in young individuals it extends sometimes even slightly beyond them. The upper margin is usually slightly convex above the eyes and the apex mostly a little turned upwards; in a very young male specimen even almost the whole rostrum is slightly upturned and tapers more than usually towards the apex (Fig. 1*d*). On the upper margin 12 or 13 teeth are observed, rarely 9 or 10; the first tooth is commonly separated from the second by an interval twice as large as between the following, which above the eyes are equidistant and mostly placed close

together (Fig. 1*a*); towards the apex the intervals become again larger. Usually the first three teeth are placed on the cephalothorax, the fourth immediately before its anterior margin; sometimes only two are placed on the carapace and then the third tooth stands above or just before the anterior margin. The lower margin is armed with 4 or 5 teeth.

The cephalothorax of the adult male appears slightly scabriculate anteriorly, especially towards the inferior lateral margins, when seen under a strong magnifying glass, but that of the female and younger specimens is smooth.

The telson fully agrees with that of *Pal. Ritsemae* and of most other species of the genus: it terminates into an acute point, that reaches slightly farther than the external subterminal spinules.

The external maxillipedes exceed the antennal peduncles by the larger part of their terminal joint.

The first pair of legs exceed the antennal scales by their chelae and their merus reaches the distal end of the antennal peduncle; the carpus is slightly more than twice as long as the hand, the former measuring $7^1/_2$ mm. in the adult male, the latter $3^1/_4$ mm.

The second pair of legs of the adult male are of equal size and length, and just as long as the body; their joints are cylindrical, so that this species belongs to the subgenus *Eupalaemon*. The merus measures one fifth of the length of the whole leg and extends to the tip of the antennal scales. The carpus and the hand appear at first sight equally long, but, when accurately measured, the hand of both legs proves to be very slightly longer than the carpus (confer the measurements). The slender carpus, once and a half as long as the merus, presents nearly the same breadth until the middle of its length, but then gradually grows thicker until its distal end and here its diameter measures $^1/_9$—$^1/_{10}$ of its whole length. The palm, nearly as long as the merus, is cylindrical, being about as broad as thick, and justly as broad as

the distal extremity of the carpus. The fingers are four fifth or three fourth of the length of the palm and meet along their inner edges when closed. The dactylus, examined with a lens, presents two small teeth near the articulation, the first of which appears double, the second conical; the immobile finger is also armed with a small conical tooth, placed between the two opposite teeth of the dactylus. Like in the other allied species on each finger a sharp cutting-edge runs between the second tooth and the tip. These legs are covered with minute points, those on the inner margin of the joints are a little larger, appearing here as sharp thorny spinules, directed forewards; the fingers are nearly smooth. The latter are covered with rather close hairs on each side of the basal teeth and of their cutting-edge, until slightly beyond the middle of their length; for the rest the second pair of legs are glabrous.

The second pair of legs of a younger male, which is 47 mm. long, are comparatively a little shorter, measuring two thirds the length of the body: they are also less stout and thinner than the described legs of the adult male. The merus does not reach the tip of the antennal scales, so that only three fifth of the carpus project beyond it; it measures also $^1/_5$ the length of the whole leg. The carpus, again nearly once and a half as long as the merus, is almost as long as the hand, not shorter as is the case in the adult male. Its diameter at the distal end measures scarcely $^1/_{11}$ of its length. The fingers have exactly the same length as the palm and are not yet covered with hairs, but the teeth are already developed (Fig. 1*g*).

Finally, the second pair of legs of a quite young male which measures only 33 mm., are but half as long as the body. The merus projects scarcely beyond the antennal peduncle and measures again one fifth of the whole leg. The carpus is only a third longer than the preceding joint and, accurately measured, proves to be slightly longer than the hand, as in *Pal. Ritsemae*; its diameter at the distal

extremity measures $^1/_{12}$ of its length. The fingers are a little longer than the palm, still glabrous and the basal teeth are scarcely visible.

The larger ova-bearing female has about the same length as the adult male and is still provided with the right leg of the second pair. This leg measures about two thirds the whole length and is thus shorter and less stout than the legs of the adult male. The merus reaches the distal end of the antennular peduncle, as far as in the male of 47 mm. The carpus, once and a half as long as the merus, is still slightly more slender than in the male, its diameter at the distal extremity measuring only $^1/_{13}$ of its length, though the form is quite the same. The hand is distinctly shorter than the carpus, measuring four fifth of the latter, and the fingers are somewhat shorter than the palm, in the same proportion as in the adult male. Examined with a lens, the fingers present the same minute basal teeth (Fig. 1*i*) and the same cutting-edge as in the male, but they are not covered with hairs. The minute points and spinules on the surface of the joints are scarcely visible and the leg appears smooth for the naked eye.

The other ova-bearing female, that has also lost one of the legs of the second pair, agrees fully with the other. In a still younger female, 38 mm. long, the carpus appears also distinctly longer than the hand.

We may conclude from the preceding description 1° that the carpus of very young male individuals is a little longer than the hand, that both joints have the same length in middle-sized male specimens, but that the chela of the adult male is slightly longer than the carpus, 2° that the carpus of the female is constantly slightly longer than the hand, and finally that in adult specimens the carpus is once and a half as long as the merus, in younger individuals once and a third.

The ambulatory legs are as thin and slender as those of *Pal. Ritsemae*, but the terminal joints are a little longer, measuring nearly one third of the propodi, those of *Pal. Ritsemae* only one fourth. In the adult male the third pair of legs exceed the antennal scales by the length of their terminal joints, those of the female reach only to their tip. The fourth and fifth pairs of legs of the male extend as far as the third, but those of the fifth pair in the female project with their dactyli beyond the antennal scales. As has already been observed, the ambulatory legs are about as slender as those of *Pal. Ritsemae*. So e. g. the breadth of the propodi of the 5th pair measures in the adult male only $^1/_{22}$—$^1/_{24}$ of their length, in the ova-bearing females $^1/_{26}$—$^1/_{27}$, in the male of 47 mm. also $^1/_{27}$ and in the young female, which is 38 mm. long, even only $^1/_{28}$. In the adult male and in the adult female the dactyli of the third pair of legs are a little longer, those of the fifth pair but little shorter than one third of the length of the propodi. In *Pal. Ritsemae* these joints are shorter in proportion to the length of the propodi.

Closely allied to *Pal. sintangensis* is *Pal.* (*Eupal.*) *Idae* Heller, a species that has also been collected »auf Borneo" (Heller, Sitzungsber. Akad. Wiss. Wien, Vol. 45, 1862, p. 417). *Pal. Idae*, however, is an inhabitant of the Java Sea (vide de Man, in: Zool. Jahrb. 1897, p. 767) and may perhaps have been collected by Ida Pfeiffer in one of the sea-ports of Borneo; as far as I know this species is not yet known to live also in the rivers of that great island. The eggs of *Pal. Idae* are therefore probably numerous and small. This species attains a much larger size, the carpus of the second pair of legs has a different form and the difference in length between carpus and hand is much greater than in our new species.

The eggs of *Pal.* (*Eupal.*) *sundaicus* Heller are also numerous and small, the ambulatory legs are less slender and the second pair of legs present different characters.

I give the measurements (in millimetres) of six specimens (3 ♂♂, 3 ♀♀) and also those of the two type-specimens of *Pal.* (*Eupal.*) *Ritsemae* from Atjeh:

	N° 1 (♂)	N° 2 (♂)	N° 3 (♂)	N° 4 (♀)	N° 5 (♀)	N° 6 (♀)	N° 7 (♀)	N° 8 (♀)
Length of the body	57	47	33	54	45	38	49	52
Formula of the rostrum	$\frac{3}{1\,3}$	$\frac{3}{1\,3}$	$\frac{3}{1\,3}$	$\frac{3}{2}$	rostrum abnormal.	$\frac{3}{1\,0}$	$\frac{3}{1\,0}$	$\frac{3}{1\,0}$
Length of the second leg	58	30	16,2	34,5	31,5	23	29	35
" " " merus	10,75	6	3,4	6,75	6	4,75	5	6,75
" " " carpus	16,5	8,5	4,5	10,7	9	6,6	8,5	10,2
Diameter of the carpus at its distal end.	1,78	0,74	0,38	0,84	0,72	0,54	0,84	1
Length of the palm	10	4,2	2	4,8	4,5	3	4,6	5,6
" " " fingers	8	4,2	2,3	3,8	3,6	2,7	3,6	4,1
" " " hand	18	8,4	4,3	8,6	8,1	5,7	8,2	9,7
Length of the propodi of the third pair	7	4,8	The legs are wanting	5,3	5	3,7	5,6	6,7
Breadth " " "	0,4	0,26		0,28	0,26	0,19	0,28	0,35
Length " " dactyli	2,6	1,92		2,1	2	1,6	1,7	2
" " " propodi of the fifth pair	8,4	6,48		7	6,9	5,3	wanting	9
Breadth " " "	0,34	0,24		0,27	0,253	0,19		0,32
Length " " dactyli	2,5	wanting		2,08	2,06	1,66		2,2

N^os^. 1—6 *Pal. sintangensis*: N^os^. 4 and 5 ova-bearing; N^os^. 7 and 8 *Pal. Ritsemae* de M. from Atjeh: N^o^. 7 without eggs, N^o^. 8 ova-bearing.

Palaemon (*Parapalaemon*) *Trompii*, n. sp.

Fig. 2.

An adult male and an egg-bearing female collected by Max Moret in the Ketoengau river, August 1894; 4 specimens from the Mandai river at Nanga Raoen, viz. one male and three egg-bearing females; 2 very young specimens from Sintang.

Like the preceding, this new species that I like to dedicate to Mr. Tromp, the late Resident of Dutch West-Borneo, is also characterized by the female carrying only

a comparatively small number of large eggs, which are 2—2,5 mm. long and 1,4—1,7 mm. broad. *Palaemon Trompii* appears to be also a rather small species, the largest specimen (♂) being 7 cm. long, the ova-bearing females scarcely 5 cm. The tolerably slender rostrum extends usually to the end of the antennal scales, occasionally it exceeds them very slightly; the rostrum runs horizontally forward, only in one specimen it is very slightly upturned distally and the upper margin appears almost straight above the eyes, very rarely a little convex. The upper margin bears 11, rarely 10 or 12 teeth, which stand until the apex; the first tooth is placed immediately before the middle of the cephalothorax and usually the four proximal teeth are placed on the carapace, the fifth before the orbital margin, occasionnally already the fourth stands above the latter. The teeth on the carapace are nearly equidistant, the interspace between the penultimate tooth and the antepenultimate is mostly a little wider than the interval between the penultimate and the last. In the male specimen from the Mandai river the rostrum very slightly exceeds the end of the antennal scales and the penultimate tooth stands as far distant from the last as from the antepenultimate. The lower margin is armed with 4—6 teeth.

I observed under the microscope on the cephalothorax of the adult male, anteriorly near the inferior margin, many minute thorny points, but the greatest part of the cephalothorax appeared smooth. The hepatic spine is scarcely half as long as the antennal one and placed just behind and somewhat below the latter. The apex of the telson fully agrees with that of the preceding species.

The external maxillipedes exceed the antennal peduncle almost by the whole length of their terminal joint, in the male as well as in the female.

The first pair of legs of the adult male exceed the end of the antennal scales by a third of their carpus, in the younger

male and in the female specimens only by the hand; in the adult male the carpus is very slightly more than twice as long as the hand, in the other specimens the chela is justly half as long as the carpus. The fingers are a little longer than the palm.

The second pair of legs are of moderate size and subequal, the larger leg being the right or the left. In the adult male from the Ketoengau river the larger left leg, that is little more than half as long as the body, exceeds the end of the antennal scales by the whole length of the hand. The almost cylindrical merus measures $^1/_5$ of the whole leg and extends to the end of the antennal peduncle. At first sight the carpus appears as long as the merus, but accurately measured it proves to be very slightly longer than the latter.

The carpus widens a little towards its distal end, so that here its diameter measures $^1/_5$ of its whole length; this joint appears therefore moderately slender. The chela is almost twice as long as the merus and the fingers nearly as long as the palm; the latter is about 4 times as long as broad and very slightly wider than the distal end of the carpus, the palm is also a little broader than thick, as is proved by the measurements. The fingers meet together along their whole length and each of them is armed with three minute basal teeth (Fig. 2*g*); the distance of the foremost tooth of the immobile finger from the articulation measures about $^1/_3$ of the whole length of the finger and the third or foremost tooth of the dactylus is a little farther distant from the articulation. The second tooth is slightly larger, but the first or proximal one is the smallest of all. Each finger is furnished with a sharp cutting-edge between the foremost tooth and the apex. The other leg is very slightly shorter, but agrees for the rest with the left; the dactylus presents four minute obtuse teeth, the two first of which are a little smaller than the two distal ones and the immobile finger has two teeth. The

second legs are smooth, the small thorny points, by which these legs in other species are roughened, wanting throughout; fine, moderately long hairs, however, are scattered on all their joints and these hairs are characteristic of this species.

In the ova-bearing female from the Ketoengau river the right leg is the larger; it measures $^2/_3$ the length of the body and exceeds the end of the antennal scales by a third of the carpus. As is proved by the measurements, this leg agrees with that of the male as regards the relative length of the joints, but the fingers are very slightly shorter than the palm. Each finger (Fig. 2*i*) presents five obtuse teeth, but the fifth or foremost is placed on each a little farther distant from the articulation; on the dactylus this tooth is but slightly more distant from the apex than from the articulation and on the immobile finger it is placed likewise a little farther forewards; on each finger a sharp cutting-edge unites again the foremost tooth and the apex. The carpus widens slightly less towards its distal end and the palm is somewhat broader in proportion to its length than in the adult male: the palm appears therefore distinctly wider than the carpus, the difference being greater. The left leg is a little shorter than the right, the carpus slightly more slender, the width at the distal extremity measuring only $^1/_6$ of its length and the palm is a little narrower, the fingers are armed each with 4 minute teeth.

In the young male from Nanga Raoen the left leg is also a little shorter than the right and its joints appear slightly more slender. Both legs exceed the end of the antennal scales by a fourth of the carpus. As in the adult male, the right leg is but little more than half as long as the body. The merus measures $^1/_5$ of the whole leg, the carpus is again slightly longer and the diameter at its distal end measures $^1/_6$ of its length. The hand is once and a half as long as the merus and appears therefore comparatively shorter than in the

adult male. The palm, very slightly shorter than the fingers, is distinctly wider than the distal extremity of the carpus and appears a little less thick than broad, about in the same proportion as in the adult male. The immobile finger presents 5 obtuse teeth, the dactylus 4. The chela of the other leg is narrower, but the fingers have the same toothing.

Amongst the three ova-bearing females from Nanga Raoen the two legs of the second pair are only present in one. The right leg is the larger, measures $^2/_3$ the length of the body and exceeds the end of the antennal scales by a third of the carpus. The latter, again very slightly longer than the merus, has the same form as in the adult male from the Ketoengau river, the diameter at the distal end being $^1/_5$ the length. The chela is likewise almost twice as long as the merus, and the fingers are but very slightly shorter than the palm, that is distinctly wider than the distal end of the carpus and a little wider than thick; the immobile finger is armed again with 5, the dactylus with 4 obtuse teeth, the foremost of which is but little farther distant from the apex than from the articulation, as in the other specimens. The left leg is a little shorter, the carpus somewhat more slender and the palm scarcely wider than the end of the carpus; the toothing is the same.

The second female bears only the smaller leg and in the third both are wanting.

One leg is only present in the young male from Sintang and this leg agrees with the described, as regards its characters and the length and dimensions of its joints. The chela is comparatively shorter than in the adult specimens, being once and a half as long as the merus; the fingers, each of which is still only armed with three teeth, are scarcely longer than the palm, that is distinctly wider than the end of the carpus and somewhat less thick than wide. On the dactylus the distance of the third or foremost tooth from the articulation measures one third the length

of the finger, that of the first one fifth and the second tooth, that is a little larger than the two others, is placed just in the middle; the foremost tooth of the index is situated between the second and the third tooth of the other finger.

We may conclude from the preceding descriptions that the legs of the second pair are a little unequal, that the merus is constantly very slightly shorter than the carpus, the diameter of which at its distal extremity measures $^1/_5$ its length in the larger leg of adult specimens; that in the latter the chela is almost twice as long as the merus, in younger individuals only once and a half times and that the palm of the larger leg is always distinctly wider than the end of the carpus and a little wider than thick. The foregoing description proves furthermore that the fingers of the larger leg of the adult male are nearly as long as the palm, those of younger males very slightly longer, that the fingers of the females, however, are a little shorter than the palm and finally that they are armed at the base with 3, 4 or 5 minute obtuse teeth and with a sharp cutting-edge between the foremost tooth and the apex. The smaller leg is a little shorter, the carpus somewhat more slender and the palm scarcely wider than the end of the carpus, but for the rest this leg agrees with the other. The second legs are smooth, not roughened by minute thorny points, and moderately long hairs are scattered on their joints.

The ambulatory legs are slender and thin; they are smooth, though somewhat hairy. In the adult male the 3rd pair of legs exceed the antennal scales by their dactyli, and the fourth and the fifth reach nearly as far; in the younger males and in the females the third pair of legs

extend only to the end of the scales. The breadth of the propodi of the 3rd pair of legs of the adult male measures $^1/_{15}$ of their length, of the females $^1/_{13}$—$^1/_{16}$; the dactyli are very slightly longer than $^1/_4$ the length of the propodi, in the very young male from Sintang they measure almost $^1/_3$. The breadth of the propodi of the 5th pair (Fig. 2*m*) is $^1/_{23}$—$^1/_{24}$ their length, and the dactyli measure about $^1/_5$ the length of the propodi.

This species, that may belong to Ortmann's subgenus *Parapalaemon*, the palm of the 2nd pair of legs being distinctly wider than the end of the carpus and the fingers being armed with several minute teeth, seems to differ from all other species. It differs indeed from the allied species 1°. by the smaller number of large eggs, carried by the female, 2°. by the characters of the rostrum, four teeth standing on the cephalothorax, 3°. by the second pair of legs being smooth, and provided with scattered hairs and 4°. by the three, four or five minute obtuse teeth with which the fingers are armed.

The rostrum of *Pal.* (*Parap.*) *Horstii* de M. from Celebes bears some resemblance to that of this new species, but the second pair of legs are roughened by thorny points, the fingers are shorter and the ambulatory legs are more robust.

The eggs of *Pal.* (*Macrobr.*) *bariensis* de M. from Flores are very numerous and small, the carpus of the second pair of legs is slightly shorter than the merus and appears less slender, the hand finally is considerably wider. *Pal.* (*Macrobr.*) *lampropus* de M. from Celebes is another allied species, but the rostrum is armed above with 16 or 17 teeth, which are placed closer together. The chela of the larger leg has a different form, the palm being broader and its inner margin making almost a straight line with the inner margin of the immobile finger. The fingers of the larger leg are shorter and armed with more

teeth, this leg is also not quite smooth but covered with minute points. The ambulatory legs finally are less slender. Young specimens may be distinguished at first sight by the characters of the rostrum.

Pal. dayanus Henderson from India bears also some resemblance, but the upper margin of the rostrum presents only 7—9 teeth, the second or third of which stands above the orbital margin and the fingers of the second legs are finely ridged longitudinally on all sides. The ova of this species have also a large size.

In *Pal. asperulus* v. Mart. from Shanghai the carpus of the second pair of legs is shorter than the palm and these legs are scabrous.

Pal. (*Eupal.*) *elegans* de M. from Buitenzorg, the ova of which are likewise of large size, 1,4—1,5 mm. long and 1—1,1 mm. broad, is certainly different. An adult male and an ova-bearing female are before me. The rostrum has another form and presents different characters. The second pair of legs of the adult male are larger, stouter and distinctly scabrous; the dactylus bears characteristic tubercles, that are not observed in *Pal. Trompii*. The ambulatory legs finally are more robust.

Pal. (*Eupal.*) *dispar* v. Mart. has a different physiognomy. The carpus of the second pair of legs is more elongate and more slender. The palm is cylindrical and not broader than the carpus, the fingers are armed with more numerous teeth and these legs are scabrous. The eggs finally are small.

Pal. (*Eupal.*) *sundaicus* Heller is, like the preceding, an *Eupalaemon*, the carpus of the second pair of legs is longer, the palm scarcely broader than the carpus and almost cylindrical, the toothing of the fingers is different, the eggs are very numerous and small, having a diameter of 0,50—0,65 mm.

The measurements of *Pal.* (*Parap.*) *Trompii* in mm. are the following:

	N° 1 (♂)	N° 2 (♀)	N° 3 (♂)	N° 4 (♀)	N° 5 (♀)	N° 6 (♀)	N° 7 (♂)
Length of the body	68	48	50	47	47	49	30
Formula of the rostrum	$\frac{4}{1\,1\,6}$	$\frac{4}{1\,1\,5}$	$\frac{4}{1\,0\,4}$	$\frac{4}{1\,1\,4}$	$\frac{3}{1\,1\,4}$	$\frac{4}{1\,3\,5}$	$\frac{4}{1\,3\,5}$
	right left	right left	right left	right left			
Length of the second leg	38 40	33 29,5	28 26,5	30 26	27,5		17
" " " merus	7,5 7,5	6,25 6	5,6 5,6	5,75 5,3	5,5		3,5
" " " carpus	8 8	7 7	6,4 6,4	6,5 6	6,3		4
Diameter of the carpus at its distal end	1,65 1,66	1,34 1,1	1,04 0,96	1,35 1,04	1,12		0,66
Length of the palm	6,6 7	6,5 5,2	4,4 4,2	5,6 4	4,7		2,5
" " " fingers	6,2 6,75	5,7 4,6	4,5 3,88	4,8 4	4,1		2,7
" " " chela	12,8 13,75	12,2 9,8	8,9 8,1	10,4 8	8,8		5,2
Breadth of the palm	1,8 1,9	1,85 1,35	1,26 1,04	1,7 1,1	1,27		0,8
Thickness " " "	1,5 1,6	1,5 1,2	1 0,88	1,4 0,92	1,1		0,6
Length of the propodi of the fifth legs	7,8	5,3	5,4	4,8	5,2	4,5	3
Breadth " " " of the third legs	0,5	0,32	0,27	0,34	0,34	0,34	0,22
Length " " dactyli	2,1	1,44	1,34	1,3	1,4	1,34	0,9
" " " propodi	9,5	6,8	6,7	6,3	6,7	6	
Breadth " " "	0,4	0,28	0,29	0,3	0,3	0,3	
Length " " dactyli	2	1,4	1,34	1,34	1,34	1,34	

N^os^. 1 and 2 Ketoengau river; N^os^. 3—6 Mandai river at Nanga Raoen; N^0^. 7 Sintang.

Palaemon (Macrobrachium) callirrhoë, n. sp.

Fig. 3.

Three males from the Mandai river at Nanga Raoen and one young male from the Ketoengau river.

Though no ova-bearing females of this apparently new species have been collected, I suppose nevertheless that the male specimens are adult or nearly fully developed and that *Pal.* (*Macrobr.*) *callirrhoë* belongs, like the two preceding, to the species of small size. The largest specimen measures only 43 mm. from the apex of the rostrum to the extremity of the telson.

The rostrum of all four specimens extends to the extremity of the antennal scales and is slightly

directed downward, so that the apex is situated a little below the surface of the carapace; an imaginary line that unites the points of the teeth of the upper margin, appears very slightly convex. The upper margin is armed with 9 or 10 teeth; in the specimens from Nanga Raoen the three first teeth are placed on the cephalothorax, the fourth above the orbital margin; in the young individual from the Ketoengau river the four proximal teeth stand on the carapace, the fifth immediately before the orbital margin. The first tooth stands justly before the middle of the cephalothorax and is a little smaller than the following; the teeth are equidistant and they occupy the whole upper margin until the apex. The rostrum is vertically rather low, though not in such a degree as in *Pal. placidulus* de M. In the two adult specimens from Nanga Raoen the lower margin of the rostrum presents two well-developed teeth justly in the middle, in the individual from the Ketoengau river three; the rostrum of the youngest specimen from Nanga Raoen is broken off.

Examined with a lens, the carapace appears very slightly pubescent, minute microscopical hairs being scattered on it; for the rest it seems to be smooth, not scabrous. The hepatic spine is situated behind and distinctly below the antennal one. The shape of the telson is different from that of the two preceding species, as may be seen by a comparison of the figures. The telson is less elongate, as it is comparatively shorter and broader; it appears broader towards the triangular apex, which terminates into a small apical spine. This spine reaches a little farther backwards than the external subterminal spinules.

The short flagellum of the internal antennae is distinctly serrate.

The external maxillipedes exceed the antennal peduncle with two thirds of their terminal joint, reaching to the

distal extremity of the penultimate joint of the antennular peduncle.

The first pair of legs exceed the extremity of the antennal scales with a third of the carpus, in the young specimens with a fourth; the carpus of the two adult specimens is exactly twice as long as the hand, the fingers of which are about as long as the palm, the chela of the younger individuals is slightly more than half as long as the carpus.

The second pair of legs are a little unequal; with the exception of the young male from Nanga Raoen, the right leg is the larger. The right leg of the male from Nanga Raoen, which measures 43 mm., is but little shorter than the body. The cylindrical merus reaches almost to the end of the antennal scales, the carpus and the hand projecting beyond it. The obconical carpus is very slightly shorter than the merus, its diameter at the distal end measures $^2/_5$ of its length, so that the carpus is of a compact shape. The hand is about three times as long as the carpus and the fingers are very slightly shorter than the palm; the latter is about three times as long as broad and appears distinctly broader than the carpus, because the palm is in the middle once and a half as broad as the distal extremity of the preceding joint. The palm is a little wider than thick, the proportion being as 7 : 5; it is, however, not compressed, because both the upper and the under surface are transversely slightly convex and because the inner and outer margins are likewise rounded. The fingers are slender, the index makes a concave line with the inner surface of the palm; on each finger one observes above and below a longitudinal elevated ridge that runs from the articulation to the tip. The dactylus (Fig. 3*f*) is armed with a strong and sharp conical tooth exactly in the middle of its length, a second similar though slightly smaller tooth

is observed between the former and the articulation, somewhat closer to the latter than to the tooth on the middle of the finger. The immobile finger presents two similar teeth; the distal one has the same size and form as the middle tooth of the dactylus and is situated immediately behind it, the proximal just behind the proximal tooth of the other finger. A sharp cutting-edge unites on each finger the distal tooth with the pointed curved tip. The upper surface of the palm is closely covered with small thorny spinules that occur also on the outer surface; on the lower surface these spinules are somewhat larger and stand not so close together and on the inner margin they form two longitudinal, parallel rows of larger spines, between which the surface is smooth. The fingers are somewhat hairy. The carpus is covered with similar spinules, rather closely set, except on the inner surface, where larger spines form two longitudinal rows and these spines have the same size as those on the inner surface of the palm. Similar spinules are everywhere placed on the merus, and they are larger on the lower surface than on the upper.

The left leg is 6 mm. shorter than the right and exceeds the end of the antennal scales by the hand and two thirds of the carpus. The latter is likewise a little shorter than the merus and both joints have the same shape as in the other leg. The chela is $2^1/_2$ times as long as the carpus and the fingers have the same length as the palm; the form of the palm is the same as in the other leg but it appears scarcely broader than the distal end of the carpus. The proportion of the width and thickness of the palm is the same as in the other leg. The fingers present also the same toothing, but the index is armed with a third tooth just behind and contiguous to the proximal one; they are likewise slightly hairy. As regards the spinulation of the surface of the joints, both legs agree with one another.

The second pair of legs of the other male, long 41,5 mm.,

are somewhat shorter in proportion to the length of the body; the carpus is a little more slender and the spines on the inner surface of this joint and of the hand are less developed, but for the rest these legs agree with those described above.

The young male from the Ketoengau river likewise agrees with the preceding, in both legs the merus appears quite as long as the carpus; the carpus of the shorter left leg is a little more slender, being slightly more than three times as long as broad at the distal extremity and the fingers are a little longer than the palm.

In the youngest male from Nanga Raoen the left leg (Fig. 3*g*) is longer than the right and reaches with the hand and a third of the carpus beyond the end of the antennal scales; the right leg, 1,5 mm. shorter, exceeds the scales with the hand. In both legs the carpus is slightly shorter than the merus and appears a little more slender than in the adult specimens, its diameter at the distal extremity measuring scarcely one third of its length. In both legs the dactylus is armed with two, the immobile finger with three minute teeth. The distance of the distal tooth of the dactylus from the articulation is, in both legs, slightly larger than one third of the length of the finger, that of the proximal tooth exactly one fourth of it. The distance of the foremost or third tooth of the index from the articulation measures, in both legs, one third of the length of the finger, that of the second tooth from it one fourth; in the left hand the first or proximal tooth, somewhat smaller than the two others, is contiguous to the second, in the right hand its distance from the articulation measures one sixth of the length of the finger. Minute thorny points are already developed on the inner surface of carpus and palm; they present themselves as small spinules on the inner margin, but the outer surface of these joints is still nearly smooth. The third pair of legs extend to the end of the antennal scales, the following reach slightly less foreward.

The ambulatory legs are moderately slender. The breadth of the propodi of the third pair measures $^1/_{10}$—$^1/_{11}$ of their length, the dactyli of the adult individuals measure $^1/_3$ of the propodi or slightly less, in the young specimens they are slightly longer. The propodi of the fifth pair are as usually a little more slender, their breadth measuring $^1/_{14}$—$^1/_{15}$ of their length; the dactyli measure in the adult $^1/_4$ of the propodi, in the younger specimens they are a little longer. I may add that the meri of the third pair of the largest male are 4,6 mm. long and seven times as long as broad.

The ambulatory legs are a little hairy, short fine hairs being distributed over their joints.

Palaemon (*Parapalaemon*) *Horstii* de M. from Celebes is an allied species, but has a larger size. The chela of the second pair of legs, however, is not broader than the carpus, the fingers are considerably shorter than the palm and less slender, the ambulatory legs finally are still more robust, the meri of the 3rd pair e. g. are only five times as long as broad.

Pal. (*Macrobr.*) *bariensis* de M. from Flores is likewise a species of small size. The rostrum is shorter and armed on the upper margin with 12—16 teeth. The hand of the second legs is broader in proportion to the distal extremity of the carpus and the palm is more compressed, namely in the proportion of $7 : 4^1/_2$ and its inner margin is rather sharp; the palm is covered with minute rounded tubercles that stand not close together and the fingers of the larger chela are considerably shorter than the palm.

Pal. (*Macrobr.*) *pilimanus* de M. from Sumatra is also a quite different species.

Pal. callirrhoë is represented in the State of Santa Catharina, Brazil, by *Pal. potiuna* F. Müll., to which it is most closely allied. (Confer: Ortmann, Os camarões da agua doce da America do sul, in: Revista do Museu Paulista N°. II, 1897, p. 209, Pl. I, fig. 9).

Measurements in mm.:

	N° 1 (♂)		N° 2 (♂)		N° 3 (♂)		N° 4 (♂)	
Length of the body	43		41,5		30 [1])		35	
Formula of the rostrum	$\frac{3}{9}$		$\frac{3}{10}$		Rostrum broken.		$\frac{4}{10}$	
	right	left	right	left	right	left	right	left
Length of the 2nd pair of legs	38	32	29	24	19,5	21	24,5	19,5
" " " merus	6,5	5,5	5	4,5	3,6	3,9	4,25	3,5
" " " carpus	6	5,25	5	4,5	3,4	3,7	4,25	3,5
Diameter of the carpus at its distal extremity	2,4	2	1,8	1,5	1,06	1,14	1,5	1
Length of the palm	9	6,5	6,25	4,5	3,6	4,2	5,25	3
Breadth of the palm in the middle	3,5	2,25	2,5	1,65	1,1	1,36	2	1,25
Thickness of the palm	2,6	1,6	2	1,35			1,65	0,9
Length of the fingers	8,5	6,5	6,25	4,75	3,8	4,2	5	3,75
" " " hand	17,5	13	12,5	9,25	7,4	8,4	10,25	6,75
" " " propodi of the third pair	4,1		4		3,3		3,26	
Breadth " " "	0,4		0,37		0,31		0,3	
Length " " dactyli	1,24		1,32		1,24		1,16	
" " " propodi of the fifth pair	4,9				4,1		3,9	
Breadth " " "	0,34				0,28		0,27	
Length " " dactyli	1,24				1,2		1,1	

Nos. 1—3 Nanga Raoen, N°. 4 Ketoengau river.

Palaemon (*Macrobrachium*) *pilimanus* de M.

Confer: de Man, in: Max Weber, Decapoden des indischen Archipels, 1892, p. 471.

One adult male from the Upper-Sibau river.

One male and one ova-bearing female, both of middle size, from the Mandai river at Nanga Raoen.

3 young individuals, one of which with eggs, from the Ketoengau river.

3 young males, one adult and one younger female, both with eggs, from Sintang.

7 young specimens from the Kapoeas river at Sanggau.

1) The rostrum being broken, the distance between the anterior margin of the carapace and the end of the telson is given here.

As has been indicated in my paper quoted above, this species, that hitherto was only known to inhabit the lakes and rivers of Sumatra and Western Java, exhibits considerable variation in the characters of the rostrum and of the second pair of legs. The measurements given below prove that also the form of the ambulatory legs is variable, that their joints appear rather robust in some individuals, as e. g. in the adult male from the Upper-Sibau, in others tolerably slender, as in the adult female from Sintang. The same variation is exhibited by specimens from Sumatra, which are before me, as may be seen by comparing the specimens from the lake of Singkarah with those of the lake of Manindjau.

Palaemon pilimanus belongs to those species the fertilized eggs of which are large. The eggs of the two females from Sintang, one of which is adult, the other of middle size, are equally large, viz. 1,8 mm. long and 1,1 —1,2 mm. broad; those carried by the small female from the Ketoengau river that is only 30 mm. long, have the same size. The eggs of Sumatra-specimens are also 2 mm. long (de Man, l. c. p. 472).

The largest specimen, the male collected in the Upper-Sibau river, is 60 mm. long from the tip of the rostrum to the end of the telson. The formula of the rostrum, that reaches to the end of the antennular peduncle, is $1\frac{4}{2}$, the fifth tooth is placed above the orbital margin and the rostrum is directed slightly downwards. The rostrum of the adult female from Sintang extends straightly forwards, as far as in the preceding specimen, and its formula is $1\frac{6}{3}$; the teeth above the eyes stand closer together than the proximal and distal ones. For the other female the formula is $1\frac{4}{3}$ and for the three males $\frac{4}{2}$, $1\frac{4}{2}$ and $1\frac{5}{1}$; for the male from Nanga Raoen it is $1\frac{5}{4}$ and for the female $1\frac{4}{3}$. Like the specimens from the Ketoengau river, those that were collected at Sanggau are all young, of small size and 25—30 mm. long, though some already carry eggs.

Measurements in mm.:

	N° 1 (♂)		N° 2 (♀)		N° 3 (♀)	N° 4 (♂)	N° 5 (♂)	N° 6 (♂)		N° 7 (♂)	N° 8 (♂)	N° 9 (♂)	N°10 (♀)	N°11 (♀)
	right	left	right	left				right	left					
Length of the second leg	58	45	45	31				21	28					
" " " merus	12	9,5	11,5	7,5				4,75	7					
" " " carpus	6,5	5,25	5	4,25				3	3,5					
Breadth " " "	4,25	2,8	3	1,8				1,3	2					
Length " " palm	13	9,5	10	5,75				3,5	6,5					
Breadth " " " in the middle	6,5	3,5	4,6	2,4				1,66	2,8					
Thickness of the palm in the middle	4,5	2,5	4	1,8				1,25	2,25					
Length of the fingers	15	10,5	9	5,5				4,5	6					
" " " hand	28	20	19	11,25				8	12,5					
of the legs of the third pair: " " " merus	7,4		7		5,6	4,4	4	5		4,9	4,8	4,6	4,3	4,5
of the legs of the third pair: Breadth " " "	1,16		0,82		0,67	0,76	0,63	0,71		0,86	0,82	0,68	0,53	0,62
of the legs of the third pair: Proportion between the length and the breadth of the merus	$6\frac{1}{2}$		$8\frac{1}{2}$		$8\frac{1}{3}$	6	$6\frac{1}{2}$	7		$5\frac{2}{3}$	6	$6\frac{4}{5}$	8	$7\frac{1}{6}$
of the legs of the third pair: Length of the propodus	5,8		6		4,36	3,7	3,3	4		4	3,8	4	3,6	3,8
of the legs of the third pair: Breadth " " "	0,64		0,47		0,38	0,46	0,38	0,38		0,56	0,52	0,42	0,33	0,37
of the legs of the third pair: Proportion between the length and the breadth of the propodus	9		13		$11\frac{1}{3}$	8	$8\frac{2}{3}$	$10\frac{1}{2}$		7	$7\frac{1}{3}$	$9\frac{1}{2}$	11	10
of the legs of the third pair: Length of the dactylus	2,1		2,1		1,7	1,54	1,4	1,54		1,54	1,4	1,5	1,4	1,4

N°. 1 Upper-Sibau river; N^os^. 2—5 Sintang; N°. 6 Nanga Raoen; N^os^. 7—11 Sumatra: N^os^. 7 and 8 Lake of Manindjau, N^os^. 9—11 Lake of Singkarah.

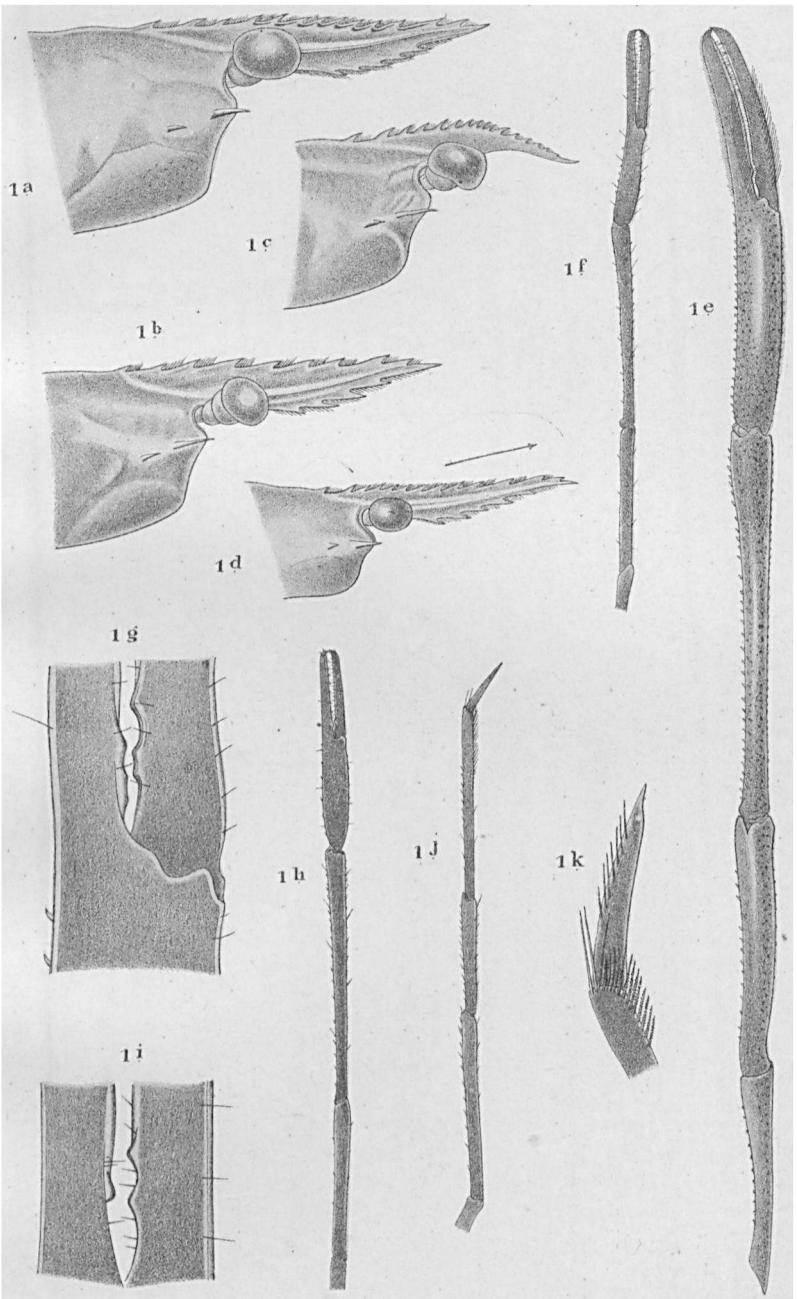
Ierseke, June 1898.

EXPLANATION OF PLATES 6—8.

Fig. 1*a*—*d*. *Palaemon* (*Eupalaemon*) *sintangensis*, n. sp.: anterior portion of carapace of four examples, × 3, viz. *a* of the adult male, 57 mm. long; *b* of the ova-bearing female, long 54 mm.; *c* of the other ova-bearing female with monstrous rostrum; *d* of the young male, long 40 mm. Fig. 1*e* second leg of the adult male, long 57 mm., × 3. Fig. 1*f* second leg of the male specimen, long 47 mm., × 3. Fig. 1*g* enlarged view of the toothing of both fingers of this male, × 25. Fig. 1*h* second leg of the ova-bearing female, long 54 mm., × 3. Fig. 1*i* the toothing of both fingers of this leg, × 25. Fig. 1*j* fifth leg of the adult male, long 57 mm., × 3. Fig. 1*k* terminal joint of this leg, × 10.

Fig. 2*a*—*c*. *Palaemon* (*Parapalaemon*) *Trompii*, n. sp.: anterior portion of carapace of three examples, × 3, viz. *a* of the adult male from the Ketoengau river; *b* of the male and *c* of the female from the Mandai river. Fig. 2*d* telson of the adult male from the Ketoengau river, × 3. Fig. 2*e* apex of this telson, × 25, the hairs between the inner subterminal spinules have not been figured. Fig. 2*f* the larger or left leg of the second pair of the adult male from the Ketoengau river, × 3. Fig. 2*g* toothing of both fingers of this leg, × 25. Fig. 2*h* right leg of the female from the Ketoengau river, × 3. Fig. 2*i* toothing of both fingers of this leg, × 25. Fig. 2*j* right and Fig. 2*k* left leg of the second pair of the female from the Mandai river, × 3. Fig. 2*l* hand of the right leg of this female, × 6. Fig. 2*m* fifth leg on the left side of the adult male from the Ketoengau river, × 3.

Fig. 3*a*—*b*. *Palaemon* (*Macrobrachium*) *callirrhoë*, n. sp.: *a* anterior portion of the adult male from the Mandai river, *b* that of the young male from the Ketoengau river, × 3. Fig. 3*c* telson of the adult male from the Mandai river, × 6. Fig. 3*d* right and Fig. 3*e* left leg of the adult male from the Mandai river, × 3. Fig. 3*f* toothing of both fingers of the larger right leg, × 6. Fig. 3*g* left leg of the second pair of the young male, long 30 mm., from the Mandai river, × 6. Fig. 3*h* toothing of the hand of this leg, × 12. Fig. 3*i* left leg of the 5th pair of the adult male from the Mandai river, × 6.



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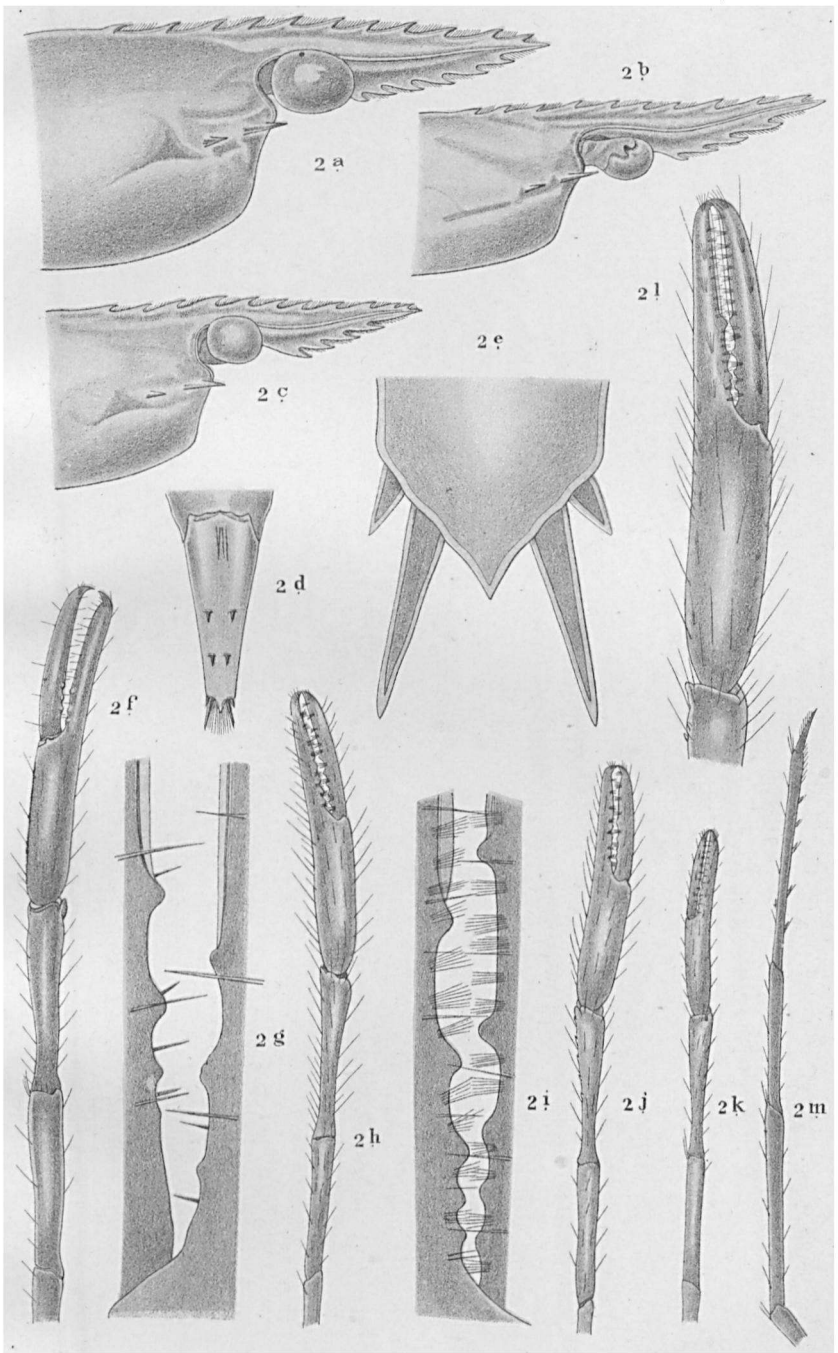
Palaemon (Eupalaemon) sintangensis *de Man.*



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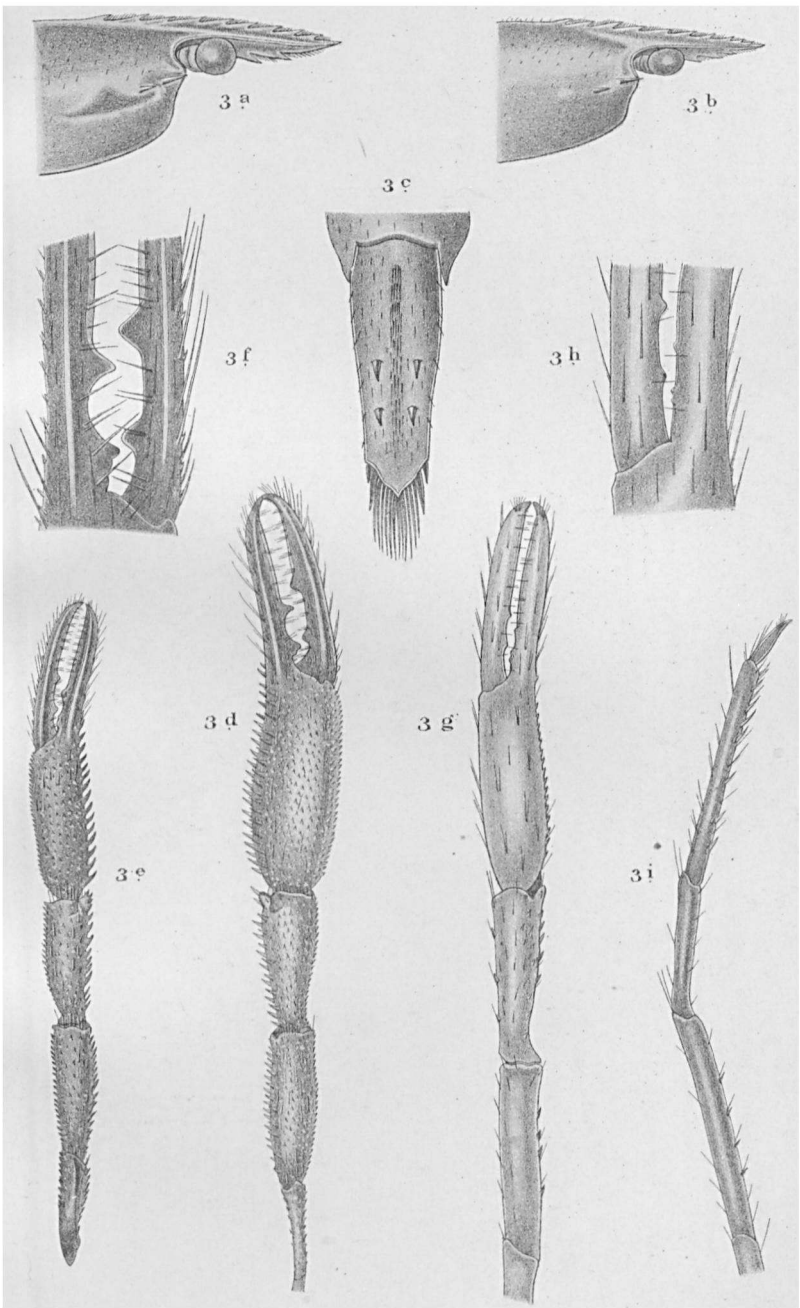
Palaemon (Parapalaemon) Trompii *de Man.*



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Palaemon (Macrobrachium) callirrhoë *de Man.*